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VIEWS, NEWS AND INTERVIEWS.

Mayor Matthews, of Boston, who will accept the management of the Boston gas companies on February 1, 1895, is quoted as saying that while he is in favor of giving towns and cities the right to light their own streets and buildings, he has never believed in encouraging them to manufacture and distribute gas or electricity for commercial purposes.

A little girl in Gorham, on first discovering the electric lights and seeing the moon at the same time, propounded this conundrum:

"Mamma, does God know that we have got electric lights?"

"Yes," replied the mother. "He must know it, because He knows everything."

"Then, mamma, why don't He take in the moon?"—*Portland, Me., Daily Press.*

In 1891 a young electrician, now in Paris, on looking through Carnegie's great steel rail plant at Braddock, Pa., casually suggested that electricity could be made to operate the widely separated pieces of machinery at a saving of many thousands a year. Last week Andrew Carnegie visited the plant for the first time in two years and saw electricity doing the work. This improvement, together with others, makes it possible for eight men to do the work 300 did in 1891.

A Mexican professor of physics proposes to foretell earthquakes by connecting telephones to the pipes of deep artesian wells and to metal plates sunk in deep mountain crevices. Any unusual noise in the bowels of the earth would be audible in the telephone and would indicate trouble.

Professor Alexander Graham Bell recently said, in answer to the question as to what effect legislation in favor of corporations will have upon future electrical inventions: "It is only equitable to protect the company which has employed the mechanic's brains and skill, but it is manifestly unjust to withhold from the mechanic all future right to his own inventions and improvements. In my own case, of the American Bell telephone, when I was a young man I disposed of all my patents to the company, and in addition gave up all rights to all future improvements on the telephone."

At the Hotel Metropole, in London, on November 16, the representatives of the staffs of the Eastern, Eastern Extension, Direct United States and Associated Telegraph Companies, over which Sir John Pender presides, presented to him a silver trophy to mark the twenty-fifth anniversary of the opening of cable communication with the Far East, and to record their admiration of his labors in the cause of submarine telegraphy.

Recently the employés of the Rivermont electric railway line at Lynchburgh, Va., went on strike. Mr. John P. Pettyjohn, the president of the company and a prominent citizen of the town, immediately took a striker's place and acted as a motorman on one of his cars until the men resumed work.

Popular Electrical Lectures at Syracuse, N. Y.

"Electricity as Applied to Everyday Life" is the subject upon which Paul K. Browd, a graduate of Cornell University, began a course of 10 lectures in the parlors of the Y. M. C. A. at Syracuse, N. Y., on November 16. About 50 young men, who have manifested a desire to become versed in the rudiments of electricity, were present and listened attentively to the interesting remarks of Mr. Browd.

New Adjusting Device for Street Car Signs.

The Davidson Ventilating Fan Company, of 137 Milk street, Boston, Mass., have just added a very neat device to their large line of electrical specialties, in the shape of a new system of regulating street car signs by one movement and from the inside of the car. As will be seen from the accompanying illustration, the method is extremely simple and is adapted for either solid or illuminated signs.

The shape and adjustment of the signs is similar to those now in use on the cars of the West End company in Boston, but anyone who has watched the frantic efforts of the conductors to change their signs by means of a long pole, either while the car is in motion or in the rush of reversing at the end of the line, will appreciate the ease and rapidity with which this new method accomplishes the work.

NEW ADJUSTING DEVICE FOR STREET CAR SIGNS.

Each sign is hung on an axle, the ends of which are fitted with beveled gears, and a single turn of the wrist is sufficient for their simultaneous adjustment.

For electric cars where an illuminated sign is desired, the lettering is painted on glass, as in our illustration, and a couple of incandescent lamps inside, operated by the same switch which lights the car, bring the sign out very strongly.

The device is the invention of Mr. Henry S. Hall, one of the directors of the Davidson company, and they will have the exclusive sales agency. A complete model is now on exhibition in their store on Milk street.

The Lincoln, Ill., electric street railway has been sold to W. H. Patterson, of Bloomington, for $75,000. An extension of the line will be begun at once.

The Cotton States and International Exposition, Atlanta, Ga.

The Cotton States and International Exposition Company has closed a contract with Chicago parties for the erection of a scenic railway. It will have an undulating track and cover 700 feet of space. The same concern had a scenic railway at the Midwinter Exposition in San Francisco and it was one of the most popular features.

The bids for foundations of the Agriculture, Forestry and Electricity buildings for the Cotton States and International Exposition were opened and the contract was awarded to the General Construction Company, of Atlanta, last week.

Ridall Sues the Brush Company.

A suit has been filed in the United States Circuit Court, at Pittsburgh, by John E. Ridall against the McKeesport Light Company and the Brush Electric Company, of Cleveland, Ohio, to recover over $100,000 in commissions. Ridall claims that he and Eugene Ingold had a contract with the Brush company by which they were to be agents in Allegheny and in 19 surrounding counties in Western Pennsylvania. He says that although the Brush company patents were valid, the two companies allowed infringements on them and thus Ridall and Ingold lost commissions.

LITERARY.

The publishers announce that the date of publication of Funk & Wagnalls' Standard Dictionary will be November 28, at which time the delivery of Volume II will begin; also the delivery of the single volume edition. By actual count the Standard Dictionary contains, exclusive of the appendix, 301,865 vocabulary words and phrases, and the appendix of proper names, foreign phrases, etc., contains 47,468 entries, making the total vocabulary of the dictionary 349,333—this after great care has been exercised to exclude all useless words. The immense increase of the vocabulary of the English language appears from the fact that the vocabulary of Webster's International Dictionary is 125,000 and the Century Dictionary is 225,000.

ELECTRICITY ON SHIPBOARD—ITS PRESENT POSITION AND FUTURE DEVELOPMENT.

READ BEFORE THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS, NEW YORK, NOVEMBER 16, 1894, BY S. DANA GREENE, LATE ENSIGN UNITED STATES NAVY, ASSOCIATE.

I.—PRESENT POSITION.

When the enormous increase in the practical applications of electricity on land during the past 10 years is compared with what has been done in the same direction and during the same period on shipboard, one is inclined at first thought to conclude that the naval architect and engineer are behind their professional brethren on shore in appreciating and utilizing a new and exceedingly flexible form of energy.

During the period named immense central stations have grown up in every town and city of the land, filling the streets with their ever extending feeders and mains, and supplying light, power and heat to thousands of consumers. The horse railroad has become a back number, and in its place we see the electric trolley car, while in the largest cities the electric underground and storage battery cars are proving their reliability and sounding the death knell of the cable. Enormous water powers, hitherto inaccessible or undeveloped, have been harnessed to the electric dynamo and their power transmitted over distances and through territory previously impassible, to industrial centers, where business and enterprise have had opened to them new channels of activity and profit. The telephone and telegraph have covered the continent with their network of connections and practically annihilated space. Last, but by no means least, capital has been attracted by this new and flexible agency, electricity, and money has not been lacking to continue the marvelous work of development on lines and in directions of still greater magnitude and with greater practical results. Europe has led in the evolution of some branches of the science of electricity, as it has before led in other sciences, but in practical demonstrations and applications America is undoubtedly in the lead and from present indications will remain there. This is due partly to the resources at our command, but principally because of the practical nature and the well-known ingenuity and boldness of the American engineer in applying scientific principles to practical problems, in new ways and with new agencies.

On shipboard electricity has at last been recognized as the proper agency for lighting, and apparatus and methods of installation have been so improved and standardized that the electric ship plant can now be relied upon for continuous and economical service. Beyond this it cannot be said that electricity has been introduced to any considerable extent in marine installations, although the future gives promise of many new applications. Inasmuch, however, as practically all other applications aboard ship are dependent upon the lighting plant, it is natural that the best engineering skill has been occupied in perfecting the latter. As a result there have been developed for marine work a special type of generating set (engine and dynamo), special appliances (switches, junction boxes, cut-outs, stuffing tubes, watertight globes and lanterns, etc.), special insulation for conductors, special methods of wiring, special forms of search lights and special men who may properly be called "marine electricians." These apparatus and appliances differ materially from those in use on shore, and must be used under service conditions entirely dissimilar. Salt water, salt air, steam and the excessive heat of ship boiler and engine rooms would play havoc in a very short time with the best modern shore installation, as they have, in fact, with many of the early ship plants, and if there is any place in the engineering world where the old axiom of "Penny wise and pound foolish" should be stamped in large letters it is on the plans of an electric marine plant. Such installation is expensive when compared with similar work on shore, the first cost being perhaps 100 per cent or more greater. Inferior material and workmanship are sometimes employed on shore, and fair results obtained by careful supervision and management of the plant. Such a policy is unwise under any circumstances, but aboard ship it is fatal; depreciation at once becomes heavy and rapid, and the marine plant has no manufacture or repair shop close at hand to repair damages or supply new material, nor are there always skilled electricians aboard ship to locate the cause of troubles and apply the remedy promptly.

It is wise for the naval architect, in designing and installing a marine electric plant, whether it is for a man-of-war, merchantman or yacht, to see that the material is ordered from manufacturers who have made a specialty of marine apparatus, and to have it installed by practical marine electricians, who, besides knowing something about electricity, know what a ship is and what the conditions are at sea. Finally, the plant should be put in charge of good, practical, dynamo tenders, by which is meant men who are familiar with both steam and electrial machinery and their fittings. The best practice in electric installations is to be found in the various navies of the world, where specifications are always more rigid and work is better done (at greater expense, of course) and more closely inspected. It is gratifying to know that in establishing and maintaining the high standards of excellence which have characterized the vessels of our new navy, and which have given these vessels an international reputation, the electric plants have kept pace with the other parts of the construction and equipment, and they are to-day the finest examples of marine installations afloat. In an able article on "Naval Dynamo Machinery," recently published in the proceedings of the United States Naval Institute, Lieutenant J. B. Murdock summarizes his experience of many years study and practice, coupled with an extensive personal inspection of the best European naval installations, by saying that "our electrical plants are in most respects superior to those in use in other navies, but deteriorate more rapidly." This deterioration has been due in the past, partly to the fact that strength and durability have been sacrificed to some extent (as admitted by Lieutenant Murdock) to secure the greatest compactness and least weight, and partly to the fact that the navy has had to create and develop a class of men competent to operate ship plants and to keep them in repair. The first difficulty has been remedied in the latest designs of apparatus now being furnished the navy, and the latter difficulty is gradually remedying itself through the school of practical experience, so that the deterioration in the future will undoubtedly be much less than it has been in the past.

The limits of this paper do not admit of a detailed discussion of the standard naval specifications, but every naval architect should study them carefully and apply them in all places where circuits, lights, apparatus or appliances are exposed to sea conditions; as, for example, on the upper decks, in the engine and boiler rooms, coal bunkers, storerooms, lower compartments, etc. The following brief resumé covers some of the most important points.

LOCATION OF PLANT.

On war vessels the plant is properly considered as one of the vitals of the ship, and is always located below the protective deck, in a compartment by itself, near the boilers and as near the center of the ship as possible. These compartments require artificial ventilation, and even then are often uncomfortably hot (aboard the "San Francisco," for example, the temperature ranges from 120 degrees Fahrenheit up). In some of the larger war vessels abroad there are two plants, located in different parts of the ship, one for ordinary service (above the protective deck) and the other for service in action (below the protective deck). The practice of dividing the plant, however, is more expensive in first cost, as well as in operation and deterioration, and is bad on general principles. It has never been adopted in our service. In some merchant vessels and yachts the plant is located in the main engine room, to save expense in piping and in extra supervision and attendance. The presence of moisture, live steam or flying oil in the main engine room, however, is very injurious to electrical apparatus, and where possible the plant should always be located in a compartment by itself, near the boilers (to insure a short lead for the pipes) and near the engine room, so that the engineer on watch can, with a few steps, see that the plant is receiving proper attention. The ventilation of the room should be good, and the temperature should not be excessive. The nearer the plant is to the center of the vessel, the less will be the cost of copper in the distributing circuits. With the earlier types of apparatus, care had to be exercised to locate the plant at a sufficient distance from the compasses to prevent the influence of the magnetic field of the dynamo on the magnetic needle. The modern dynamo, however, with its closed magnetic circuit, has no appreciable influence on a compass needle at a distance of 15 feet.

CHARACTER OF GENERATING UNITS.

Engine and dynamo should always be direct coupled (*i. e.*, the armature shaft of the dynamo should be directly connected to the engine shaft). Belts take up room, are liable to stretch and slip (from the rolling or heeling of the vessel, or from oil) and reduce the efficiency of the plant from five per cent to 15 per cent, depending upon local conditions. The best practice is to provide a fixed coupling, readily accessible, between dynamo and engine. A reserve capacity should always be provided, if space allows. In the navy the present practice seems to provide a reserve of from 25 per cent to 33⅓ per cent of the full load duty of the plant, a separate unit furnishing the reserve. Thus, the full load service of the "New York" requires about 85 horse-power dynamo capacity, which is supplied by two (2) units, while a third, of 21 horse-power, furnishes the reserve.

In some recent marine installations the reserve capacity is even greater (50 per cent or more of full load duty) and it is always wise to have at least one reserve unit which can be kept ready for service at all times. In small vessels the reserve capacity must necessarily be less on account of the limited space available.

Engines should be of the open type, compact and strong, with rigid frames, large bearing surfaces and liberal clearance in the cylinders. Vertical engines occupy much less deck space than horizontal and are better adapted for ship service. There should be special provision for relieving the cylinders quickly of water, since a broken cylinder head or a cracked cylinder may cripple the plant seriously; both hand and automatic relief valves should be provided. Engines should be fitted for atmospheric and vacuum exhaust and should be able to operate satisfactorily with considerable variations in pressure, since they may have to take their steam from either the main or auxiliary boilers. The cups for all oil feeds should be grouped in front of the cylinders where they are accessible and readily seen. There should be an automatic governor for speed regulation and the speed should not vary more than five per cent when full load is suddenly thrown on and off, for uniform speed of dynamo is very necessary for the satisfactory and proper operation of lights and motors. Vertical engines, whether simple or compound, should have two cranks to insure smooth and quiet operation. With the present size of marine plants, the consumption of steam is so small, as compared with the total amount used for other purposes, that it has not been thought necessary or advisable to complicate the plant by introducing compound engines; but as the uses of electricity increase in number and variety (thus necessitating larger generating plants) it will probably be found economical to introduce the compound type. It is frequently used abroad at the present time.

The multipolar type of dynamo should be used, since it permits of slow armature speed, less weight, greater compactness and closed magnetic circuit. With the four pole type only two brushes are necessary, and this is a distinct advantage. The commutators (of bronze or hardened copper) should have ample bearing surface and deep bars (one inch to one and one-half inches), so as to admit of considerable wear without replacement.

Dynamos should be compound wound (insuring automatic regulation of the electro-motive force with change of load) and should be provided with a field rheostat to compensate for the change in resistance of the field winding, when hot or cold. Armature and fields should be most carefully insulated and the insulation resistance of both should be carefully tested before the plant is accepted; it should not be less than one megohm. The maximum rise in temperature above the surrounding air (measured immediately after a full load test of not less than four hours) allowed in any part of the dynamo must be small, for high internal heat is certain to impair or ruin the insulation in time, and then the plant is useless without extensive repairs. The naval specifications are very rigid in this respect, the maximum temperature rise being only 50 degrees Fahrenheit. This makes the dynamos expensive, and a limit of 60 degrees to 70 degrees Fahrenheit can be allowed with reasonable safety in the merchant marine, unless the location of plant is particularly unfavorable as to temperature and ventilation.

Dynamos and engines should always be tested together as a complete unit.

The full load efficiency of the unit, as measured by the ratio

$$\frac{\text{Electrical horse-power at dynamo terminals}}{\text{Indicated horse-power of engine}}$$

should be not less than 80 per cent; with the best types of marine sets it runs as high as 83 per cent to 85 per cent. This applies to a unit with simple engine. The curve of efficiency falls off at light load (the efficiency being about 75 per cent at three-fourths load, 70 per cent at one-half load and 55 per cent at one-fourth load) and it should be arranged, therefore, that the units in operation at light loads should be loaded to at least 75 per cent of the capacity.

The efficiency of units abroad is often determined by the consumption of water (in pounds per hour) per electrical horse-power hour of output, and where the necessary apparatus is available for making the test it is undoubtedly more satisfactory than the measurement only of the initial horse-power of engines and the electrical horse-power of dynamos. This method of test is now followed in large central stations where triple and quadruple expansion, vertical, condensing engines are used, coupled direct to two dynamos, one at each end of the shaft, and varying in size from 600 to 2,500 horse-power.

The switchboard is an important accessory of the dynamo room and, in common with all other appliances and devices used aboard ship, should be made of non-combustible material. The body of the board should consist of slate or marble and no wood is permissible in its construction. The instruments and connections on the board should be accessible and compactly arranged and the positive and negative connections should be symmetrical. Any dynamo should be able to operate on any circuit, either single or in multiple with the other dynamos. Switches for different dynamos and circuits should be plainly marked so that the operator cannot make a mistake in their manipulation.

Examples of Electric Fittings for Naval Uses.

THE WIRING OF VESSELS.

This is the most difficult and expensive, as well as the most important, part of the installation. With the wiring installed many of the circuits are very inaccessible, and should a fault occur it is difficult to locate and still more difficult and expensive to remedy. It is imperative, therefore, that only the very best material and skilled labor obtainable should be employed. Probably the best example of the highest grade wiring to be found is in our own naval vessels, and the specifications of the Navy Department are very rigid and complete. In Europe and especially in England, it was the practice for several years to use what is known as the "single conductor system" of wiring, where one conductor only is run from the dynamo to the lamps, the hull of the vessel being utilized as the return conductor. The practice, however, has never found favor in this country and it has a number of serious faults, with the single argument of cheapness in its favor. Recent practice abroad, evidently based upon unfavorable experience, does not favor it and the system generally used is the two-conductor, insulated metallic return system. In England experiments have recently been made with a concentric cable, where one conductor is placed concentrically outside and insulated from the other in one cable. Such a cable has the advantage of materially reducing the labor of wiring a ship, while still retaining the advantages of a completely insulated metallic circuit; but it is not wise, in the writer's opinion, to abandon our standard two wire separate conductor system until the success of the new method has been thoroughly demonstrated by several years test at sea. The wiring should be divided in separate circuits, lights which are located in the same parts of the ship and which are ordinarily used at the same time, being grouped on the same circuit. These several circuits are then carried back to the switchboard in the dynamo room where they are so connected that they can be independently controlled. The number of these circuits depends entirely on the size of the vessel and the number of lights required. In large vessels the expense of running each circuit back to the switchboard becomes very heavy, and to reduce this "feeders" are led to certain predetermined "centres of distribution," where they are connected by means of suitable junction boxes to the circuit mains, which in turn light a certain section of the ship. In our naval vessels circuits are classed as "battle circuits," including the lights needed in action, and "lighting circuits," which include the lights for ordinary illumination. At general quarters all lights on the lighting circuits are at once cut off at the dynamo room switchboard. In a merchant vessel lights in the engine and fire rooms, cargo spaces, storerooms and quarters should be on separate circuits, the sub-division of circuits being varied to suit individual vessels. On all exposed decks and in boiler and engine rooms, cargo spaces, storerooms and passengers' steerage, standard navy water-tight mouldings and fittings (junction boxes, switches, etc.,) should be used. Some of these fittings are shown in the cuts. In the quarters of officers and cabin passengers, standard non-combustible fittings, such as are used on shore, can be safely used.

The present standard navy wire has no lead covering. It was formerly required as a mechanical protection and water-proof covering of the wire, but it was found that in handling the wire aboard ship the lead covering was very apt to become broken, thus allowing water to soak in between the covering and the wire and the ragged, broken edges were frequently driven into the insulation of the wire to such an extent as to "ground" the metallic conductor to the hull of the vessel. Furthermore, it was practically impossible to discover defects in the insulation of the wire under the lead covering before the wire was put in place, and these defects often caused trouble later in service. The writer advocated the abandonment of the lead covering in 1887, after a year's experience with it on board the cruiser "Atlanta," where many of the circuits had to be entirely replaced during that period. The insulation of the wire should be depended upon to prevent troubles (the best rubber covered wire only being used) and a good heavy braiding affords all the mechanical protection needed, beside the moulding. Samples of all wire should be subjected to rigid electrical and physical tests before use. If a new ship is to be wired, the work should be done while the vessel is building, and the writer believes that the circuits for the engine and fire rooms, the coal bunkers and for the exposed decks should be run in continuous iron tubes, having water-tight joints and an inner lining of insulating material. It is almost impossible to prevent trouble on these circuits with the ordinary wooden moulding, and the iron tube method is successfully employed on shore in such places as breweries, dyeing establishments and chemical works, where the conditions are as trying as they are at sea. The loss in the wiring should not exceed five per cent, and the expense is not excessive if this loss is limited to three per cent.

The electro-motive force of all United States naval plants is 80 volts. This standard has been adopted in order to permit the use of search lights and incandescent lamps on the same dynamos without the interposition of too much dead resistance in the search light circuit; and as the search lights are an important part of the military equipment of a naval vessel, the adoption of a non-commercial voltage for the plant may be justified. But in merchant vessels no such important reason exists, and the voltage should range from 100 to 120 volts, so that commercial incandescent lamps can be used.

All wiring, fittings and fixtures should be of bronze, or composition with bronze finish, no iron being used.

A ship plant, if installed in accordance with the best modern practice and on the general lines which have been described, can be relied upon for continuous and efficient service, provided it has a reasonable amount of care in operation, testing and inspection. The electric lighting of ships can be fairly said to have developed to a point where standard specification can be drawn and followed. It seems, therefore, proper to consider some of the possible future developments in the uses of electricity on shipboard for purposes other than illumination.

(To be continued.)

National Electric Light Association.

The headquarters of the National Electric Light Association during the eighteenth convention, which will be held at Cleveland, Ohio, February 19, 20 and 21, 1895, will be at the Hollenden Hotel. The meetings will be held at Army and Navy Hall, conveniently located with reference to the hotel.

American Institute of Electrical Engineers.

At a meeting of the council, held in the Institute's new offices in the Havemeyer building, 26 Cortlandt street, on November 21, 11 new associate members were elected and five associates were transferred to full membership.

THE DEFINITION OF REACTANCE.

COMMUNICATED TO THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS BY CHARLES PROTEUS STEINMETZ AND FREDERICK BEDELL.

At the Philadelphia meeting of the American Institute of Electrical Engineers, May, 1894, the name "reactance" was officially adopted by the Institute and defined in accordance with a paper on reactance communicated by us and reprinted in most of the electrical periodicals. The action of the Institute was unanimous, and its definition has met with general approval. Objection to it, however, has been raised in an article* recently communicated to a French periodical. Since we cannot agree with the arguments forwarded in this article, it will be in place for us to state our views thereon.

The definition of reactance adopted by the American Institute of Electrical Engineers is:

"Reactance is the component of electro-motive force at right angles to the current, divided by the current."

By this definition the term reactance is the quotient of the reactive electro-motive force divided by the current, where the reactive electro-motive force includes all wattless electro-motive forces, whether due to inductance, capacity, polarization or counter electro-motive force of any kind, as of synchronous motors, and excludes all energy components, as would be introduced by motors, transformers, hysteresis, etc.

In objecting to this definition the writer referred to takes a position essentially as follows:

1. The term reactance shall include the effects of self-induction and capacity only.

2. It should always be defined by the equation

$$I = \frac{E}{\sqrt{R^2 + K^2}};$$

Where: I = current;
R = ohmic resistance;
E = electro-motive force;
K = reactance.

3. For harmonic currents

$$K = \omega L - \frac{I}{C\omega};$$

Where: L = self-inductance;
C = capacity
$\omega = \frac{2\pi}{T}$ = pulsation.

4. The term "reactance" has a right to exist only because it is a constant of the circuit. Defined, however, as the quadrature component of electro-motive force divided by the current, it is the complex resultant of different reactions and not a constant of the circuit. All terms in "ance" should denote constants of the circuit, and whenever used in a generalized meaning, an additional term should be added, as "apparent reactance."

We may state that when investigating the question of properly defining the term "reactance," we have fully considered the position taken by this writer. We have, however, come to the conclusion that his definition is not tenable, but is contradictory, for the following reasons:

1. Neither in the one nor in the other definition is "reactance" a constant of the circuit, except in circuits containing no iron. In reality, circuits nearly always contain iron, and in such circuits the reactance can be considered as approximately constant only in a very limited range. When extended over a greater range of electro-motive force or of current the self-inductance, and thus the reactance, varies. The same applies to most of the other quantities ending in "ance," as impedance, reluctance and permeance, and thus the statement that quantities in "ance" should be constants of the circuit is against the adopted practice and not fulfilled by either definition.

2. Where iron is present the statement for harmonic currents

$$K = \omega L - \frac{I}{C\omega}$$

contradicts the definition of K by the equation

$$I = \frac{E}{\sqrt{R^2 + K^2}},$$

R being taken as the ohmic resistance and K as reactance. This is due to the presence of hysteresis. These relations do hold in the absence of iron, and such cases were taken by us in our paper to illustrate the definition for simple cases; the fundamental definition, however, should in our opinion be sufficiently general to include circuits with iron. Consider an harmonic current flowing in a circuit embracing iron; for simplicity assume capacity absent. The last equation would not give any direct relation between the inductance and reactance, such as would be obtained from the equation just preceding, but would make reactance still a more complex quantity, by including therein not only the effect of self-induction, but that of hysteresis as well. Furthermore, it would lead to the result that the reactive electro-motive force is not wattless, but includes an energy component, an idea quite foreign to the term.

These considerations obliged us to discard any indirect definition of reactance by means of the term inductance, and to adopt the more direct definition analogous to the definition of resistance.

The definition of resistance is Ohm's law:

$$R = \frac{E}{I},$$

where E and I represent an unvarying electro-motive force and current, respectively.

Considering E and I as an harmonic electro-motive force and an harmonic current—or in the case of alternating quantities which are not simple harmonics, as their equivalent harmonic values; that is, values of equal square root of mean square value and equal power—the above equation gives the definition of impedance:

$$\text{Impedance} = \frac{E}{I}.$$

Our proposed definition for reactance is analogously written:

$$\text{Reactance} = \frac{\text{reactive E}}{I}.$$

Further, we may define the equivalent resistance of the circuit by the expression:

$$\text{Equivalent resistance} = \frac{\text{power E}}{I}.$$

In the absence of expenditure of energy outside the electric conductor, this quantity coincides with the true ohmic resistance.

These quantities are thus defined directly and in a uniform manner. How far these quantities are constants of the circuit depends upon the circumstances; in any case reactance and impedance depend upon the frequency.

The phenomena taking place in an alternating current circuit cannot fully be represented by the terms ohmic resistance, inductance and capacity, but a further term has to be introduced, representing the losses of energy outside of the electric conductor, as hysteresis, etc., and the most satisfactory way to do this appears to us to be the generalization of the term "resistance" to "equivalent resistance."

The use of "equivalent" values for quantities is employed in the paper on "The Law of Hysteresis, III." In the discussion of this paper at the Philadelphia meeting the significance of these values is pointed out.

Wherever the reactance is generalized to include active counter electro-motive forces, it may well be distinguished by the denotation "equivalent reactance."

We would emphasize the utility of two rectangular components, whether electro-motive forces or currents are resolved. Reactance should always, in our opinion, be associated with that which represents no expenditure of energy, the reactive electro-motive force being at right angles to the current and the reactive current (the wattless current) being at right angles to the electro-motive force. Whether we resolve currents or electro-motive forces depends upon the problem in hand; each method has its advantages. If we resolve the current, we may write:

$(\text{Current})^2 = (\text{power current})^2 + (\text{reactive current})^2$.

Divided by E, this gives:

$(\text{Admittance})^2 = (\text{conductance})^2 + (\text{susceptance})^2$, for a simple case; in general, for conductance and susceptance we should write equivalent conductance and equivalent susceptance. Admittance, conductance and susceptance are thus used as the inverse correspondents of impedance, resistance and reactance, and may be added as vector quantities. Many alternating current problems are much simplified by this treatment. It is important, however, to employ components which are at right angles to each other, and for this reason the definition of the American Institute of Electrical Engineers seems preferable. It is in this point that the definition is fundamentally different from that of the French writer already referred to. In the absence of hysteresis losses the definitions would be the same, applying the term equivalent reactance to the case where counter electro-motive forces other than those due to capacity and self-induction are present. To conclude, then, we may say that in the absence of iron we may define reactance in terms of inductance and capacity, as this writer has done, and as has been done by us in the illustrative examples in our paper; the fundamental definition, however, should, in our opinion, remain in the general form adopted by the American Institute of Electrical Engineers.

In a note to our original paper we have called attention to the first suggestion of the term reactance by M. Hospitalier in May, 1893, and the recommendation of the committee appointed by the Société Internationale des Electriciens to consider the programme for Chicago Congress, 1893. The term is a happy one; it is international, and uniformity in its use is to be desired.

In our opinion the best definition for "reactance" is that adopted by the American Institute of Electrical Engineers. In this, as in all matters, there is, however, room for difference of opinion. The reasons for thus defining the term have not before been published, but we believe that when they are duly considered the action of the Institute will meet with international approval.

* "Apropos de la Reactance," by Professor Andrè Blondel. *L'Industrie Electrique*, Sept. 25, 1894.

Leather Belts.

No one using leather belts can afford to be indifferent to their care. There is a certain amount of elasticity in all good leather belting, but time and continued hard work seem to destroy or at least weaken its power. Then comes the question whether it is better to simply tighten the belt or use some form of dressing. Experience of many very practical observers seems to favor the use of a good dressing, as tightening the belt strains it and calls for more engine power. A dynamo engineer who is transmitting 60 to 65 horse-power with a 50 foot link belt eight inches wide, running from a 72 inch pulley on driving shaft to a 13 inch pulley on dynamo, claims that freedom from jumping and flickering of the lights is due entirely to the belt dressing used and that tightening never helped. The superintendent of a large printing establishment has an 18 inch main belt now running its eighth year which has never been taken up, and it would be extremely hard to convince him that the dressing used does not preserve the life of the leather and keep it soft and elastic. Of course, one should be careful what sort of dressing is used. Soap, resin, tar and tallow should not be used at all. Even castor oil is criticised. The dressing used in the two cases cited was Dixon's belt dressing and leather preservative, which was the only article that would start the big driving belt used at the Paris Exposition in 1878, and keep it from slipping. Circulars about the dressing will be sent to anyone interested by the Dixon Crucible Company, Jersey City, N. J.

SUGGESTIONS FOR AN INDEX OF ENGINEERING LITERATURE.

ABSTRACT OF A PAPER READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK AND CHICAGO, NOVEMBER 21, 1894, BY PROF. GEORGE D. SHEPARDSON.

What seems to be the best method of securing the publication of an index that shall avoid the failings of those already existent? One of the first considerations is, that the compilation of an index which will be an improvement upon all existing ones must be the result of the co-operation of a large number of people, as was Poole's Index, to which over 122 libraries contributed. It will require the expenditure of a considerable amount of money and will probably not be self-supporting. Such work could probably be done best under the auspices of some society or societies, as was the Royal Society Catalogue. Since the index might well include the subjects of interest to electrical, mechanical, hydraulic and civil engineers, it seems reasonable that the various national engineering societies might combine forces to maintain the publication of an index that would be of lasting value to the engineering profession of the entire world. Since the headquarters of four of the national societies are in the same city, two of them being in the same building, such co-operation would not seem difficult. A joint committee might be appointed which would receive the confidence and the co-operation of all. They could draw upon a large constituency for co-operation and subscriptions. The committee might outline the plan for the work and prepare preliminary lists of subjects, which might be published and submitted to the members for suggestions. The committee could then call upon different members for contributions from their private index files. The committee should have authority to edit the contributions thus received. Doubtless a number of publishing houses would contribute complete files of their publications for such indexing. Indeed some of them have already made such offers to a private enterprise for such purpose. Incidently the material thus received would make a valuable addition to the libraries which are being gathered at the headquarters of the societies. Such a committee could certainly compile an index that would be far in advance of the imperfect ones now published. The vast amount of duplicate labor now expended by the papers and by individuals could then be turned to more efficient work.

In conclusion the writer begs to add some suggestions as to the style of such an index. It should include subjects relating to electrical, mechanical, hydraulic and civil and perhaps mining engineering. It should index books as well as periodicals. The references should be descriptive so far as practicable. Each subject should have a page by itself. Digests and simple references might be on separate sheets. References and sheets on each subject might be numbered consecutively for convenience in adding later notes from other files or from later publications of the same articles. Abbreviations or other symbols should indicate whether the reference is to the original paper or to a re-print, whether the paper is in full or abstract, whether accompanied by discussion and by plates or illustrations. The separate sheets should be perforated for re-arranging and rebinding, and should be printed on one side only. It might be preferable to print the whole index on cards similar to those used in the card catalogues of libraries.

In this way it would be practicable to begin publication at an early date and to issue parts at frequent intervals. The indexes to current publications could be issued without delay, and those of completed files or historical works could appear as the work proceeded. Publishing the work in sections would allow each engineer or student to purchase or subscribe for only such subjects as were of importance or interest to him. Indeed, the work, if carried out properly, would result in so massive a catalogue that few outside of libraries or other public institutions could afford to obtain the entire work.

Failure of a Motor Shaft.

A correspondent of the *American Machinist*, to whom we are indebted for the accompanying illustration, writes as follows regarding the failure of a motor shaft:

The accompanying sketch and detail weights refer to the armature shaft of an electric motor designed for intermittent service at speed from 0 to 725 revolutions per minute. The motor was subject to heavy jars and a great deal of vibration, and to partly relieve this strain it was supported on springs. All shoulders on the shaft were turned square, *i. e.*, no fillet in the corner.

After about six months' service or 60,000,000 revolutions of the shaft, it broke square off at the shoulder A B, the fracture appearing as shown: The outer band A finely crystalline and partly rusted about one-eighth of an inch wide at the top and three-eighths of an inch at bottom.

The second band B crystalline and bright, about one-eighth inch wide at bottom to 0 at top. The remaining space C was coarsely crystalline except at D, where it showed a few fibrous patches.

The shaft was made of ordinary machinery steel, such as is generally used in machine shops. Analysis of drillings taken from fracture is as follows: 0.41 carbon, 0.018 silicon, 0.205 phosphorus, 0.131 sulphur, 1.09 manganese. A second shaft broke after similar service and analysis was much better. A large steel firm recommended the following analysis for shafts subject to like stresses: 0.20 carbon, 0.05 phosphorus, 0.03 sulphur, 0.15 manganese, or even less.

Had the shoulders been filleted, the shaft would probably have lasted a little longer, and this would have been better practice.

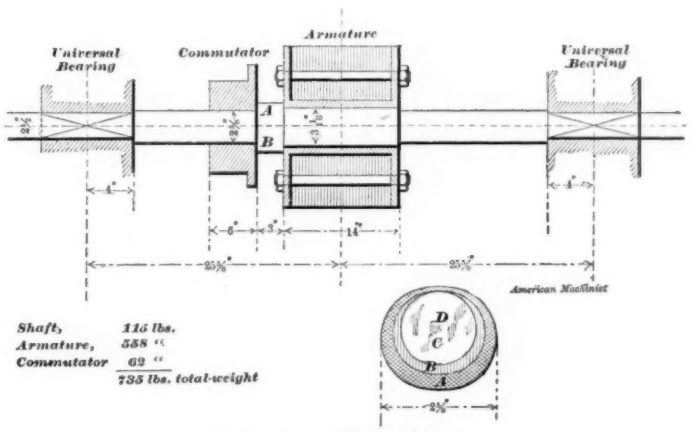
The armature was made of two half hubs, with the sheet steel disks mounted thereon and held solidly together by six seven-eighth inch steel bolts. The hub was then bored out so as to fit on the shaft by driving. After taking everything apart the shaft showed plain evidence of having deflected where supported by the hub. The rated horse-power of this motor was about 40 at 500 revolutions per minute, the power being taken off both ends of shaft equally, so the torsional moment was small.

In my opinion, the shafts of all dynamos in general are designed too small to give the best results. Compare the shafts of a steam engine and a dynamo of similar capacities; notice the vast increase in size of the engine shaft.

You say I forget the inertia of stresses, etc., so marked in the steam engine. There are stresses often very abnormal in dynamos, *i. e.*, the large mass of the armature or revolving field, as the case may be, is seldom in fair running balance, and in many cases the centrifugal forces amount to a surprising figure. The armature may not be mounted so as to revolve in the center of the field, thus giving a continuous increase of bending moment which may vary in intensity as regards the service performed by the dynamo—in lighting machines the load being practically constant, while for the street railway service the load is apt to vary from 0 to 20 per cent or more overload and very suddenly.

Again, the electrical "field" may be unbalanced; that is, the poles do not all exert the same force on the armature.

I think that the future practice will be toward larger shafts and balancing the revolving parts so as to run perfectly at the given speed, and the machine as a whole will be designed by the mechanical engineer, while the electrical engineer will have to do only with the electrical functions.



FAILURE OF A MOTOR SHAFT.

The Father of the Child.

TO THE EDITOR OF ELECTRICAL REVIEW:

In your illustration and description of Mr. Van Vleck's "Service End Cut-Out" there appears "too much Johnson and too little Van Vleck." I am not the father of that baby; my only relation to it, in fact, is a sort of cousinship, in that Mr. Van Vleck has married his invention to the Johnson vise lock switch.

Kindly correct the injustice done to a worthy parent of a worthy child, and oblige,

Yours truly,
EDW. H. JOHNSON.

New York, November 22, 1894.

OBITUARY.

Edwin Beers, of Brooklyn, N. Y., died at his home in that city on November 18. Mr. Beers was president of the Broadway Railroad Company and was interested in the Brooklyn City Railroad Company among others.

The electric street railway and the electric lighting system of Vancouver, B. C., have been sold to an English company for $350,000.

PERSONAL.

Sir David Salomons, the well-known English electrician, has accepted the mayoralty of Tunbridge Wells.

Prof. Alexander Graham Bell, of Washington, D. C., was among the distinguished visitors to New York recently.

Lieut. F. B. Badt, of the Siemens & Halske Electric Company of America, was among the Chicago men who visited New York last week.

Mr. E. S. Enyart, of Chicago, has accepted the position of general manager of the Lincoln Mutual Telephone Company, Lincoln, Ill.

Ensign G. H. Burrage, United States Navy, has been ordered to the Union Iron Works, San Francisco, Cal., as assistant to the Inspector of Electric Lighting.

Mr. Eugene Holcomb, for two years contracting agent for the Portland, Ore., General Electric Company, has gone to Chicago with the view of engaging in business.

Mr. John W. Flintham, formerly general manager of the Denver, Colo., Consolidated Electric Lighting Company, is now manager of the Salt Lake City, Utah, Copper Manufacturing Company.

Major Frank Clark, of the United States Electric Lighting Company, Washington, D. C., ran over to New York last week, transacted a week's work in 24 hours and returned to the capital city of the country. Many improvements have been put under way in his company since Major Clark, who is a retired United States officer, took hold of lighting matters in Washington.

Mr. Joel Hurt, of Atlanta, Ga., president of the American Street Railway Association, was a New York visitor last week. Mr. Hurt was returning from Boston, where the New England visitors to the recent Atlanta convention extended to him a most cordial welcome. The ELECTRICAL REVIEW hopes that Mr. Hurt's visits to New York and to its office may be more numerous.

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The scientific mind must possess imagination. The scientific man must have ideas and a ready pen. We have scientists a-plenty. Why do they not write more popular fiction dealing with scientific subjects—electricity, for instance?

Mr. S. D. Greene's address on the uses of electricity in the navy, the first installment of which appears in this issue of the ELECTRICAL REVIEW, brings out prominently the fact that only the highest class of electrical apparatus installed by the most competent marine electricians can be used with safety and satisfaction on shipboard.

A careful reading of the methods of resuscitation for persons accidentally shocked by electricity published in the last few issues of the ELECTRICAL REVIEW should be sufficient to give any electrical worker the ability to render valuable assistance to such persons and perhaps save a life. Persistence in the application of the methods is a prime requisite.

The recent explosion of gas in a subway manhole in Williamsburgh, N. Y., is proving an interesting topic of discussion among electric light men. The large amount of underground work now going on makes it necessary to know how these explosions can be prevented. It is hard work to keep gas out of a subway, but it can be done. Our columns are open to a discussion of the question. We would like especially to hear from Dr. Schuyler S. Wheeler, Mr. E. A. Leslie, Major Kearney, and Mr. J. G. White of Baltimore.

The new Subway Commission appointed by Mayor Gilroy, of New York city is composed of Mr. Hess, a member of the old commission; Major Kearney, formerly chief engineer to the commission, and ex-Congressman Cummings. Mr. Hess will assist the new board with his experience, Major Kearney has the technical ability and Mr. Cummings, who has been a printer, reporter, Washington correspondent of the *Sun* and a Congressman, is the new member of the board. He doesn't know a thing about electricity, but we are morally certain he can learn; and his process of learning will be interesting. If Uncle Amos will write a one column story for the ELECTRICAL REVIEW, giving in brief his first impressions of electrical science as expounded by the New York Subway Commission, he can leave it at this office and get a new $10 bill from our cashier.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The dominating factor in the stock market during the week under review was the reduction in the Burlington dividend from 1½ to 1 per cent. It caused considerable liquidation, prompted the bears to put out further short contracts in the grangers and drove quite a substantial element known as the general public away from the market. The prices of nearly all railroad shares have shown net declines for the week and are now much below the basis from which they started on the election rise. The short interest in the market is unwieldy, and the spasmodic rallies which occurred on various days, one of which was a feature on Saturday, are the results, pure and simple, of covering. The only two stocks which have shown pronounced weakness have been Burlington and Northwest. The latter has been sold on the idea that its 6 per cent dividend will be reduced to a 5 per cent basis. Trade reports are rather more encouraging, showing a growth of business. They all admit, however, that the low price for cotton and wheat and possibly iron are the great deterring factors against any quick return in normal business conditions.

The electrical stocks were without special feature at quotations which were fairly well sustained. News regarding General Electric was favorable. It pointed toward a steady increase in business and earnings. This stock has not been a feature of speculation for some weeks, the attention of professional operators having been absorbed by the granger shares. There are many in the street who believe that the next movement in the stock will be upward.

The extent to which the operations of the surface lines, by virtue of their cable power and transfer systems, have been cutting into the earnings of the Manhattan Elevated Railroad Company was a general topic of interest during the week. The figures published in the ELECTRICAL REVIEW last week show that the Manhattan Elevated Company has been losing heavily from those causes. It will appear as if this corporation has virtually admitted such fact through a number of radical changes which it has since made on its lines for the accommodation of the public. The most noteworthy was the establishment of the transfer system at the Battery, east and west, for the accommodation of ferry traffic and business men who work on one side of the city and live on the other.

On the New York Stock Exchange General Electric common was only moderately active and the price was steady between 34½ and 35½; Western Union Telegraph, on comparatively large transactions, fluctuated between 87 and 88. Of the less active stocks North American sold at 4½; American Telegraph and Cable was bid 89½ and held at 91; Postal Telegraph was bid 50 and held at 55.

Erie Telephone Company shows a net gain of subscribers in October of 131. The number connected October 31 was 15,932.

The Massachusetts Commission of Corporations has fixed 190 for the price at which the new stock of the American Bell Telephone Company must be offered to its shareholders. Rights not made use of will be sold at auction. It is a fact worthy of note in this connection that, despite the decision to offer the new stock at the figure stated, the market quotations, which are some 6 points higher, were not affected.

On the Boston Exchange, American Bell Telephone sold at 195 and 196. Erie Telephone was unchanged at 52½ to 53; General Electric preferred was nominally quoted at 65 bid and 70 asked; New England Telephone was bid at 66 and held at 67; Fort Wayne Electric was unchanged at 2 bid and 2½ asked; Westinghouse common advanced some 2 points, 34½ being bid and 34¾ asked. There was no change in the quotations of the preferred, they being 51½ to 52.

Wall street expects big things of the Westinghouse company after its new factories are put in operation, which will be some time about the first of the year. The directors will inspect the new works at Brinton on December 5, and will at the time probably declare the usual cash dividend on the preferred stock. Dividends on the common stock are not expected before next Summer.

The boom which is taking place in Philadelphia Electric Storage stock is attracting considerable attention in some places in New York, where considerable of the stock is held. The capital is about $12,000,000. There are very enthusiastic believers in it here, among them Mr. Isaac L. Rice, who says that it is as great an enterprise for the future as the Bell Telephone has been in the past. The telegraph and electric companies find it indispensable to their service. By successful use of the storage battery a revolution is taking place in our present methods of doing business. It will furnish motive power and light for tricycles and carriages. All that is needed is the touch of a button and the battery will do the rest. The power will last for 30 hours. There is no end to the tale of wonderful possibilities which can be accomplished. Improvement is said to be the order of the day again in this branch of electricity. BAIN.

New York, November 24.

OUR BOSTON LETTER.

The commission has decided that the new issue of Bell Telephone stock shall be sold at $190 per share.

J. C. Barr, treasurer of the Lynn Manufacturing and Foundry Company, having offices in the Hathaway Building, had a rather rough experience on Monday afternoon last, which he is not liable to forget very soon. Mr. Barr was walking down Federal street a little after three o'clock on his way to the Old Colony depot, when he was suddenly surrounded by four men, two of whom assaulted him while the others endeavored to get away with his watch and pocketbook. While taken entirely by surprise and pretty roughly handled, Mr. Barr succeeded in holding on to his valuables and the rascals finally took to their heels. One of them was captured in the New England Railroad yard and taken off in the patrol wagon, and the other three were gathered in the next day. All were identified as members of a notorious gang and most of them were wanted for other offenses. They will probably be put where they cannot exercise their particular talents for some time to come. In the meantime Mr. Barr is looking for some other route to the depot.

The officers of the Old Colony Railroad Company, whose arbitrary actions in forcibly preventing the crossing of the Rockland and Abington Street Railway Company's tracks over their line, and who were responsible for the serious riot which followed, and in which a number of persons were seriously injured, are now endeavoring to secure a pardon and their release from the House of Correction, to which place they were sentenced by the court. The motion for their release is based on the fact that they were acting under orders and consequently should not be held responsible for what they did. This being so, the responsibility should be placed where it belongs, and the official under whose orders they were acting should be the one to get the punishment. There has already been too much defiance of constituted authority on the part of the railroad companies in this matter of crossings, and they should be made to feel that there are a few other individuals on this planet who have rights worthy of respect. No doubt the summary punishment of their officers and the $20,000 damages they were obliged to pay for injuries inflicted on the citizens of Abington will have a salutary effect on the Old Colony officials to induce them to act with rather more moderation in matters of this kind hereafter.

Since writing the above the decision of the Executive Council has been handed down, and, as was generally expected, it was against the petitioners. Considerable feeling has been expressed in the arguments for and against a pardon before the council, and it was further shown in the closeness of the vote, which stood 3 to 2. Those voting against the petition were Lieutenant-Governor Wolcott and Councilors Laeson and Stevens. An immense number of protests have been received from all quarters of the State against granting the petition, showing the general interest in the case, and asking that the laws of the commonwealth be upheld.

The decision of the Supreme Court in the Bate refrigerator case, which will so greatly affect the Edison patent on incandescent lamps, is being awaited with great interest among the lamp manufacturers of Boston and vicinity. No one in the trade cares to express any opinions on the outcome of the matter, though opinions undoubtedly exist, and preparations are being quietly made to take advantage of the situation promptly, whatever it may be. There seems to be a feeling among some of the best posted men in the trade that there are troubled waters ahead, even if the patent is declared to have expired, from the numbers of the uninitiated who will rush into lamp making with the idea that it is a bonanza. While they are finding out their mistake prices will either be driven down still lower in the effort to obtain business, or the quality of the lamps will suffer materially. Lamps are now selling on an extremely small margin of profit, and any further reductions will tend to drive the supply men out of the business altogether. Among the larger users of incandescent lamps, whose experience in the past has shown them that first cost is not always the chief consideration, there will, of course, continue to be a steady demand for the higher grade of lamps at reasonable prices, but there are always a large class of consumers who never look beyond the question of cost, and it is this class from whom the trouble is looked for. The larger manufacturers already in the field and who have had the benefit of years of practical experience, have an advantage which will not easily be overcome, and if they continue to hold up prices at a figure which will give them a fair profit and still enable them to put out a first-class lamp, it will be merely a question of time when the merit of their goods will be admitted, and their trade held, save in the face of lower priced but inferior lamps.

H. G. T.

Boston, November 24.

MR. McDONALD COMPLETES HIS FORT WAYNE PURCHASE.

A SHREWD FINANCIAL OPERATION.

The final details in the purchase of the Fort Wayne Electric Company's plant at Fort Wayne, Ind., by the Fort Wayne Electric Corporation were finished between Mr. R. T. McDonald and President C. A. Coffin and Counsel F. P. Fish of the General Electric Company on November 17.

It is understood that Mr. McDonald obtained the plant at a very reasonable figure owing to another shrewd move on his part. It will be remembered that Mr. McDonald bought the plant of the Wenstrom company at Baltimore, Md., a short time ago. This is said to have been done to force the General Electric Company to accept a reasonable price for the Fort Wayne plant. After Mr. McDonald had bought the Wenstrom factory he is reported to have told Mr. Coffin that unless he was met half way in the deal for the Fort Wayne factory he would move his business to Baltimore and the General Electric Company would be left with a useless and vacant building on its hands in Fort Wayne. Mr. Coffin evidently saw the point and accepted the situation.

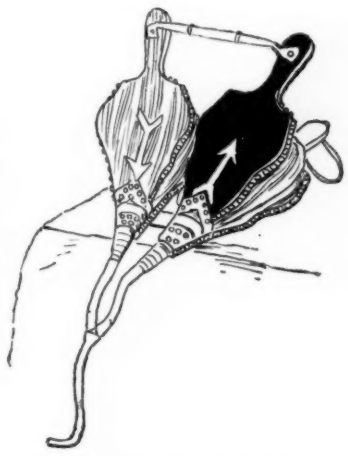
Now that the deal is completed it is predicted in certain quarters that the Wenstrom factory will be closed within six months or perhaps Mr. McDonald will sell it.

DR. GIBBONS'S RESUSCITATOR.

A MECHANICAL DEVICE FOR ARTIFICAL RESPIRATION.

Dr. P. J. Gibbons, of Syracuse, N. Y., who recently applied to Governor Flower for permission to use his apparatus—for resuscitating persons shocked by electricity—on Murderer Wilson, who is to be executed in Auburn prison, was in New York city last Saturday. He came primarily to place his apparatus in the hands of several New York physicians for experimental purposes. Incidentally he explained his methods of resuscitation to a number of reporters. Among other things which Dr. Gibbons said was this:

"To resuscitate people it is necessary simply to restore breath into them. There are a number of methods now in use for this purpose. My instrument is designed to restore suspended animation more expeditiously and more certainly than any method now in use."



DR. GIBBONS'S RESUSCITATOR.

Dr. Gibbons's apparatus consists of a pair of hand bellows whose handles are connected together. At the mouth of each bellows is fastened a flexible tube and these two tubes are connected by a Y junction terminating in a single tube. The end of the tube is inserted in the mouth of the patient, or, if this be closed, in an opening made in the throat. The patient's nose is closed and when the handle of the bellows is raised the air rushes from the patient's lungs into one apartment of the bellows. Simultaneously the other apartment is filled with fresh air through a tube on the reverse side. This air is forced into the lungs by the compression of the handles. Dr. Gibbons says a large percentage of deaths from electricity are not instantaneous and could be averted by using his invention.

We are indebted to the New York *Sun* for the accompanying illustration of Dr. Gibbons's apparatus.

The Bate Refrigerator Case.

The United States Supreme Court is not in session this week, consequently the decision in the Bate refrigerator case is not expected to be announced. It is the opinion in Washington that the Bate case will not be decided until after the holidays.

Counting by Twelves Instead of by Tens.

The decimal system of numeration seems so natural to most of us that we never think of questioning it. The fact is, however, that there is nothing natural about it; it is just as arbitrary as numeration by eights or by sixes would be—the argument in its favor is simply that it is convenient and of widespread use. Numeration by twelves was anciently common, and still survives in chronological and other divisions, as the twelve months in the year, the twelve inches in the foot, the twelve ounces in the pound. The origin of the decimal system is ascribed, no doubt correctly, to the primitive custom of reckoning on the fingers. To what was the other due? This question is ingeniously, and it seems to the *Literary Digest* correctly, answered by a writer in the *National Druggist*, November. He says:

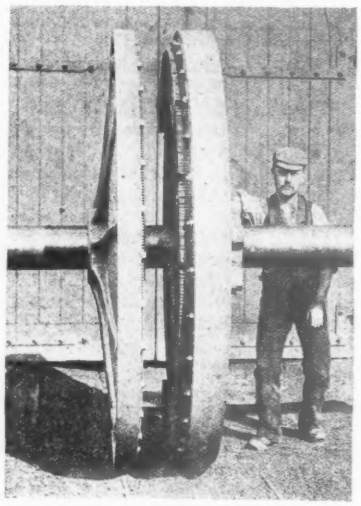
"The first man who, with a forked twig, described a circle in the sand, found, probably, before he quit playing with his newly-found figure, that if he applied the points of the fork to the furrow thus traced, and stepped them around it, he divided it into six equal parts. Subsequently, when drawing lines through the figure (aimlessly, probably, as each of us has done hundreds of times in childhood), it was found that if a line be drawn from one of the points thus obtained, through the center of the circle, it intersected the circumference at another of the points. The drawing of a line perpendicular to the first, or dividing the circle into quarters, is another perfectly natural operation, and one that would occur to anyone aimlessly making figures on the ground. The latter line, striking the periphery exactly midway between two of the original points, divides the circle into 12 equal parts.

"When primitive man first began to observe the heavenly bodies with any degree of accuracy, and with his expanding intelligence began to feel the need of the division of time into definite periods, he noted that the moon changed from a slender thread of light to the full round orb and back again to a thread in 28 days. This period was probably his first division of time (after the day, of course), and we still find savages reckoning time by 'moons.' Still later, he noted that the sun did not follow one and the same course every day, but gradually shifted until it reached a certain limit and then passed gradually backward until it again reached a limit. In the course of time man learned that the moon filled and waned 13 times while the sun was moving from one path in the heavens back to the same path again. The primitive astronomer pictured this recurrence, in his mind's eye, as a circle in which the sun was moving and finally coming back to the point of departure. He could not divide this circle into 13 parts with his rude instruments, but he could easily divide it into 12, and so he accepted the division thus naturally prepared for him. A similarly natural and rational cause may be assigned to the adoption of the prime seven as the number of the second subdivision of time (the day being the first)—the 'mysterious and sacred number seven,' concerning which so much nonsense has been written.

"The natural subdivision of the lunar month into four periods, well marked by the luminary itself, would occur to any and every person were it not for that strange tendency of the human mind, especially among primitive peoples, to seek remote and supernatural causes for every natural phenomenon, intensified, as it has been, by thousands of years of inculcation of myths erected into religious tenets."

A 500 Horse-Power Coupling of Novel Design.

A Snyer's patent coupling recently fitted up by Messrs. Cowlishaw, Walker & Company, Limited, of Etruria, at the paper mills of Messrs. Spicer, at Goldaming, where it is used to connect two eight inch shafts running at 114 revolutions per minute, and transmitting 500 horse-power, is illustrated in London *Engineering*. The clutch consists essentially of two disks, one keyed on the driving shaft and the other on that to be driven. On the face of one of these disks are a number of projecting steel teeth, while on the opposing face of the other disk are a number of steel wire brushes, which,



A 500 Horse-Power Coupling of Novel Design.

when the two disks are brought into contact, engage with the steel teeth already mentioned and form with them an elastic coupling. Owing to the elasticity, there is no shock on making the connection, even when the driving shaft runs at a high speed. In the present instance the coupling is placed close to an engine driving a long line of shafting, which can also be driven by a second engine at its other end. The clutch permits of the first mentioned engine being disconnected. The rods for working the clutch are carried up from the shaft through the floor above it, where they are connected to a hand wheel. The work of connecting and disconnecting is said to be extremely easy.

A Conference of Manufacturers.

The Manufacturers' Association, of Cincinnati and Hamilton County, Ohio, has called a conference of manufacturers to meet in Cincinnati on January 22, 1895, to interchange views and form a National Association of Manufacturers, which shall endeavor to secure legislation favorable to manufacturers, improve our foreign trade relations and to establish in South American capitals and other places permanent expositions of American products.

TELEPHONE NEWS AND COMMENT.

Berlin, Wis., is to have a new telephone exchange.

The Lykens Valley Telegraph and Telephone Company have extended their service to Loyalton, Pa.

Akron, Ohio, people will ask for a telephone franchise in that city. The Harrison system will be used if the franchise is granted.

Telephone communication between Vancouver, B. C., and Seattle, Wash., was established on November 8. The line is now open to the public.

The Southern New England Telephone Company is making progress towards restoring the service to their subscribers in the State of Connecticut.

The formation of the new Citizens' Mutual Telephone Company, at Lockport, N. Y., is not being pushed as rapidly as some of the citizens think it ought to be.

One of the growing needs of Old Town, Me., is a local telephone service to include Milford, Great Works, Stillwater and Orono with connections with the Bangor line.

The Buffalo subscribers are not sure whether they like the new $50 rate and 500-call credit or not. Some of them are much against it and talk of asking the company to go back to the former system.

The Council at a recent meeting failed to pass the ordinance granting privileges to the People's Telephone Company, recently organized in Leavenworth, Kas., with a view of conducting a telephone system.

The Oxford Central Telephone and Telegraph Company, having completed their organization, have decided to construct lines of telephone in Oxford county, Me. The first one will be from Canton to Rumford Falls.

The output of the American Bell Telephone Company for the month ending November 20 was as follows:

	1894	1893	Inc.	Dec.
Gross output,	9,815	4,235	5,580	....
Returned,	6,502	6,792	....	290
Net output,	3,313	def. 2,557	5,870	....
Since Dec. 20:				
Gross output,	81,021	76,526	4,495	....
Returned,	65,630	59,312	6,318	....
Net output,	15,391	17,214	....	1,823

The managers of the Bell Telephone Company, of Philadelphia, have a plan under consideration that involves the purchase of a dozen more or less valuable sites in as many sections of the city, besides a great improvement in the telephone service. It is proposed to build upon these lots sub-telephone stations similar to those in Kensington and Germantown. The first to be erected will occupy a lot at Ridge avenue and Thompson street, which has just been acquired. The others will be bought as rapidly as practicable.

The German postal authorities are taking great interest in the telephone cable recently laid across the East River from Thirty-eighth street, New York, to Hunter's Point, L. I. The German Government requested a section of this cable, for the purpose of placing it in the National Museum at Berlin, and in compliance with a request by Superintendent N. M. Brooks, of the Foreign Mail Service, Postmaster Dayton, of New York, has forwarded to the Post Office Department a portion of the cable. The section is six inches long, three inches in diameter and weighs three and one-quarter pounds. It will be sent to Germany immediately.

The Sunset Telephone Company recently put in operation a system of lines throughout the lower Sound country as far as the mouth of the Frazer River, reaching from Seattle, Wash., to New Westminster, Vancouver, points on the Frazer River as far as Ladner's Landing, Blaine, Anacortes, Fairhaven, La Conner, Marysville and intermediate points. This completes a continuous line about 1,300 miles long, beginning at Moscow, Idaho, running thence through Spokane, Eastern Washington, Eastern Oregon, along the Columbia River to Portland, thence through Western Washington and down Puget Sound to Ladner's Landing.

A meeting of the directors of the Harrison International Telephone Company was held recently at the company's Chicago offices. The meeting was attended by the full board of directors and many of the prominent stockholders. The object of the session was reported to be the laying out of a more aggressive campaign in the West against the Bell company, and the securing of a strong foothold in Chicago and other western cities. Ex-Secretary Stephen B. Elkins, Patrick Egan, of New York; R. C. Kerins, of St. Louis; J. R. McLean, of Cincinnati; H. M. Holden, of Kansas City, and other prominent capitalists were among those in attendance.

The Boston News Bureau says, referring to the issue of new American Bell stock at the set price of 190: "There is quite a division among the large Bell Telephone stockholders as to the wisdom of auction stock sales as well as the rightfulness of the State to take from Bell Telephone stockholders the premium on their success, although some are not so strongly against the injustice of the act as are others, and it is rumored that three of the members of the board are willing to take the whole issue of new stock themselves at 190, although, of course, this cannot be confirmed. There is also, we understand, quite a party in the company in favor of issuing bonds instead of selling stock under the act of the legislature, but all the management appears to be in favor of giving the act a fair trial."

KILLING BY ELECTRICITY.

The Public Mind is Stirred on the Question.

AN INTERVIEW WITH DR. D'ARSONVAL—EXTRACTS FROM A PAPER BY LIEUT. F. B. BADT—DR. GIBBONS SAYS HE'LL TAKE 2,500 VOLTS AND HIS APPARATUS WILL RESUSCITATE HIM—PROF. HOUSTON'S OPINION.

The articles in the ELECTRICAL REVIEW on Mr. James E. Cutler's experience with a 4,600 volt shock have stirred up to a remarkable degree the question of whether electricity kills or not. The most prominent daily papers of New York and other large cities have taken up the question and nearly all agree that the gravest doubts of the efficacy of electrocution exist. They all admit that D'Arsonval's methods of resuscitation are of the utmost value in the treatment of persons accidentally shocked.

The New York *Herald* has republished from its European edition an interview with Dr. D'Arsonval which is given in full below :

In connection with the restoration to life, by D'Arsonval's method, of a man at Pittsfield, Mass., who had received 4,600 volts of electricity in his body, the correspondent of the *Herald* to-day saw Dr. D'Arsonval and obtained some particulars.

"I am not surprised at the news," said the Doctor. "The man was dead, no doubt; that is to say, respiration had ceased. I don't know who the doctor could have been who applied my method. I have no one who represents me in the United States, but the system is very simple, and the remedy consists in restoring respiration.

"I discovered the remedy in 1887, when I immediately communicated the results of my investigations to the Institut de l'Academie des Sciences. I commenced experiments with animals and restored life in this way six times. In regard to men, I have succeeded four times when they were *foudroyé* by electricity, industrial or artificial. Let me give you a practical illustration."

The correspondent submitted and the Doctor took a handkerchief, folded it round the correspondent's tongue and pulled three or four times at intervals of about four seconds. The tongue was drawn out from three to four inches.

"*Il faut tirer virgoureusement,*" said the Doctor, blandly.

There was no doubt of that, for, after the third pull, the unlucky journalist bounded from his sitting position with the force of 100,000 volts.

The electrician calmly desisted, and the correspondent was convinced that the Doctor could pull anyone into life, or anything, or anywhere. The experiment was beyond doubt a success.

"That is all. It is very simple, you see," resumed Dr. D'Arsonval. "You must draw the tongue like that 16 times a minute. It takes sometimes five minutes, even sometimes two hours. All depends on the case submitted to the treatment. It is necessary to pull the tongue very vigorously and to never give up hope.

"I discovered this by studying cases of death by electricity. I found nothing, after the most careful examination, in the lungs, heart or head to explain the cause of death. It was a purely nervous action which caused death. Now, there is a connection between the respiratory system and the nervous system. This is a well-known fact.

"Take the case of a toreador, for instance. He delivers what appears to be a mortal blow back of the neck of the bull. The animal falls, and everyone says that the animal is dead. This is really not the case. What the toreador has done is that he has touched the spinal column; that is to say, a point known as the *nocud vital de Flourens*, so-called from its discoverer. The shock is communicated to the respiratory system, which ceases to work, and this is apparent death. To restore this action respiration must be artificially resorted to, in practically the same way as an apparently drowned man is treated."

Further particulars regarding Mr. Cutler's experience were printed in the *Herald :*

W. A. Whittlesey and J. H. Kellman, members of the company, who are both good electricians, were in the office when the accident happened, and in less than a minute they were at work over him, using the D'Arsonval method of restoring respiration, moving the arms at the rate of 16 times a minute, so that the diaphragm would work naturally, as in breathing. They did not find it necessary to draw out his tongue, as they were able to restore consciousness by moving his arms, but they would have resorted to that if necessary, as they were perfectly familiar with the D'Arsonval method.

All of the electricians connected with the Stanley company, including William Stanley, the inventor; J. F. Kelly, C. Chesney, Mr. Whittlesey and Henry Hine, are well posted in this method, having studied it in electrical literature.

A member of the company said it was not necessary to post up instructions about the shop, because there was always someone at hand who understood the matter perfectly in case anything of the kind should happen, and this was not likely except in the testing room.

Mr. Cutler was restored to consciousness in about seven minutes. During this time there was no pulse, no indication that the heart was beating, and no sign of life in any respect. The men who were working over him had little hope of his restoration and were surprised when he showed signs of life.

No physician attended Mr. Cutler, except to dress the burns upon his hands caused by the electrical current. He was back in the testing department next day and says he felt no ill effects from the terrible shock. He has been perfectly well ever since. Mr. Cutler is about 25 years old.

Under the title of "Dangers to Human Life from Electric Currents," Lieut. F. B. Badt, then of the United States Electric Lighting Company and now of the Siemens & Halske Electric Company of America, read a lengthy and interesting address before the Chicago Electric Club on August 22, 1887. The paper appeared in full in the ELECTRICAL REVIEW for August 27, 1887. He referred to D'Arsonval's experiments which had just been made public, and in the course of his remarks spoke as follows of other methods of resuscitation :

The currents so far used in commercial industry in most cases kill by stopping the respiration. Artificial respiration, by preventing asphyxia, will reinstate natural respiration. It may not be out of place here to mention a few methods of practicing artificial respiration :

1. M. Brown-Sequard states that for several years one peculiar mode of excitation to re-establish respiration in cases as named above has been used in the College of France. It consists in the application of the faradic current on both sides of the larynx under superficial incisions of the skin.

2. Artificial respiration, as usually practiced, should consist in laying the person on his back, pulling the tongue forward and extending the arms over the head; then compress the chest slowly and regularly at the rate of about 16 times per minute.

Physicians recommend that inasmuch as the current paralyzes the cerebro-spinal system, stimulants should be used, such as ammonia, alcohol, etc., for the purpose of arousing the cerebro-spinal system to action. And again: Use a one per cent solution of nitro-glycerine in two-drop doses, dropped on the tongue. This is immediately absorbed, and is one of the most powerful heart stimulants known to the medical profession.

Death from a heavy shock must be painless. It is estimated by psychologists that it takes the brain one-tenth of a second to collect itself and recognize the impression sent to it over the nerves before any act of consciousness takes place. Noting the rapidity of an electrical discharge, there can be no consciousness of such a shock.

Dr. P. J. Gibbons, of Syracuse, N. Y., who has devised a resuscitation method of his own, wants to try it on the next murderer electrocuted in New York State. Dr. Gibbons' faith in his method is such that he has stated his willingness to take a current of 2,500 volts, provided capable physicians are in attendance to follow his instructions previously given. Dr. Gibbons also believes thoroughly in D'Arsonval's method.

Prof. Edwin J. Houston, of Philadelphia, who is president of the American Institute of Electrical Engineers, is a staunch opposer of the theory that persons scientifically electrocuted with alternating currents, as provided for murderers in the State of New York, can be resuscitated by medical processes. With Prof. A. E. Kennelly he conducted experiments a short time ago, with a view to disproving the claims of D'Arsonval.

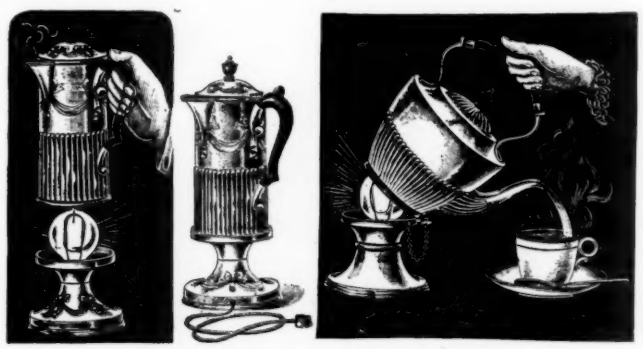
A doctor who was a State witness at the last legal electrocution in Sing Sing prison made this report :

"All the arteries of the brain were apparently ruptured, the heart entirely empty and the lungs nearly or quite so. Under such circumstances life must be absolutely non-existent a moment after the first shock."

This statement is directly opposed to the remarks of Dr. D'Arsonval in the interview quoted above where he says :

"I found nothing after the most careful examination in the lungs, heart or head to explain the cause of death."

Mr. Cutler's survival of the heaviest shock yet recorded is at least confirmatory of the fact that persons can be revived when apparently dead and casts great doubt on the success of electrocution.



FIGS. 1, 2 AND 3.—A NOVEL METHOD OF ELECTRIC HEATING.

A Novel Method of Electric Heating.

Messrs. Mappin & Webb, of Oxford street and Queen Victoria street, London, England, are the licensees from Messrs. Miller & Wood of a recently patented device for heating by electricity. The illustrations herewith are from the London *Electrician* and show a hot water jug and tea kettle. These are made by Messrs. Mappin & Webb in silver or electroplate, and 8, 16 or 50 candle-power lamps are used. The 50 candle-power lamp will boil two and one-half pints of water in 25 minutes, the 16 candle-power lamp will keep water at boiling point and the eight candle-power lamp will keep the boiling water sufficiently hot for afternoon tea. A number of other articles are made suitable for use with the electric fittings, including tea pots, coffee pots, etc. The electrical fittings are interchangeable, and sets of utensils can be supplied for use with one electrical fitting. Fig. 1 shows the lamp water heater with the water vessel removed. Fig. 2 shows the complete set. The radiant heat crosses the vacuum of the lamp and the non-circulating air without loss, and then falls on and is retained by the blackened copper and is so communicated to the water. The makers guarantee that 75 per cent of the electrical energy is efficiently utilized in heating the water and about 10 per cent additional is retained in the metal. The electric water heater is destined to supersede the out-of-date and dangerous spirit lamps until now frequently used for heating purposes in the drawing room, sick room and many other places.

Mr. Addison G. Waterhouse, the well-known inventor of the Waterhouse arc lamp and arc system, who has recently returned from Europe, is now connected with the Mather Electric Company at their works at Manchester, Conn.

ELECTRIC RAILWAY NOTES.

An electric railroad will be built from Carthage to Webb City, Mo.

An electric railway mail service has been established at Pittsburgh.

The Milwaukee, Wis., Street Railway Company has nine electric sweepers ready to tackle the first heavy snow.

A plan is said to be on foot to connect Lake Erie with Lake Ontario by an electric road by way of Tonawanda, Lewiston and Youngstown.

Electricity as a motive power is now used on every street car in the city of Buffalo. The last horse-power car disappeared from the Jefferson street line on November 10.

A. A. Anderson and John McVey, of Warren, Ohio, have asked the County Commissioners for a franchise for an electric railway running from Youngstown to Niles, a distance of 10 miles.

When the electric railroad between Middletown and Goshen, N. Y., is put in operation the Adams Express Company will establish express service between those points, using the road as a means of transit.

The directors of the Newport, R. I., Electric Railway Company have decided to reduce the fare to four cents. Newport's experiment will be watched with interest by other Rhode Island cities.

When the electric roads from Athens to Elmira and from Owego to Ithaca are finished, with others that are promised, there will be a system of electric roads connecting Binghamton, Owego, Ithaca, Athens, Elmira and Horseheads, N. Y.

The application of the Atlantic Avenue Railway Company, of Brooklyn, N. Y., for an injunction to restrain the Brooklyn Elevated Railroad Company from cutting the electric wires and removing them from the elevated structure has been denied by Judge Gaynor. Unless an agreement is reached the trolley wires will have to come down.

Chief Engineer Parsons, of the New York Rapid Transit Commission, reported last week that it would take considerable time to comply with the terms of the resolution passed at the last meeting of the commissioners and furnish estimates of the cost of constructing the proposed rapid transit roads according to the various plans submitted.

A fact which indicates the popularity of the trolley is the announcement which emanated from Philadelphia to the effect that general passenger agents of the Reading and Pennsylvania railroads are now considering the matter of reducing fares to a number of Philadelphia suburban points, including Chestnut Hill and Germantown, in order to meet trolley competition.

It is reported that Mr. D. F. Sherman, of Portland, Ore., will endeavor to effect a consolidation of the street railways of that city in the East. The Portland Consolidated (electric), East Side (electric) and Cable Railways are said to favor such a pooling if a syndicate can be formed to buy them. The City and Suburban, the most important of the three electric lines of the city, in all probability, has steadily declined to enter into any consolidation.

The Brooklyn, N. Y., municipal authorities have withdrawn their opposition to the establishment of a trolley line instead of a horse car line on Franklin avenue, alongside Prospect Park. The railroad company on this account has offered to surrender its franchise on Fort Hamilton avenue to the city for $10,000. This avenue is required by the city as a connecting drive between the Park and the new shore driveway.

A levy was made by the Sheriff of Essex County, N. J., on November 15 upon 50 trolley cars of the Consolidated Traction Company in Newark to satisfy a verdict of $7,000 damages to John Kelly for injuries received. His counsel obtained a verdict of $12,000 at the time of the trial, but the Supreme Court cut it down to $7,000. The running of the cars was not stopped, but the numbers will be taken down and they will be advertised for sale.

Gen. B. F. Tracy last week applied to Justice Gaynor in the Supreme Court for an injunction to prevent the Brooklyn, N. Y., Elevated Railroad Company from cutting the trolley wires of the Atlantic Avenue Railroad, which have been placed on the elevated structure. A contract was made between the companies for the stringing of the wires over a year ago, and the elevated company contends that its provisions have been violated.

The Nashua Street Railway Company, of Nashua, N. H., have applied to the Board of Aldermen for permission to adopt electricity as a motive power, and for the privilege of erecting the necessary overhead construction. During the past year many complaints have been received about the inefficiency of the road as operated at present, and, while no definite plans have yet been decided on by the officers of the road, they claim that if their request is complied with the work of electrically equipping the road will be begun early in the Spring. The general opinion seems to be that the plan will go through.

The Barthel Soldering Torch.

Among the many ways of conferring a favor to the community, and one that redounds to their lasting good, is to keep them good natured while performing their daily task and to thus prevent the inordinate use of "swear words" by the perfect working of their apparatus. There is nothing more aggravating or more conducive of ill nature than to have "something happen" just at the time when a piece of work is about to be completed. Particularly is this the case if the work being done is performed by the aid of a torch, for "strike while the iron is hot" applies with added force to this class of work, and the torch which needs a little adjusting at the critical moment, or, perchance, more pressure, or worse than all else, lets down the bottom and blows up the top, is of little use to practical mechanics who in the haste and rush of every-day work have little time and no patience to waste on that kind of tools. The Barthel torch, which is illustrated herewith, does not do these things, it is claimed. It is fed for two hours' work, has no pump nor any use for one. Its flame is concentrated to a point and the heat of radiation is not more than that applied to the work. It is provided with a safety plug and does not "blow up or down," but is always ready to do its work when wanted. It is constructed of heavy brass throughout, bottom and sides of one piece, and the top brazed in. It is a model of convenience and perfect workmanship. The manufacturers are the Barthel Torch Company, 113 Devonshire street, Boston, Mass.

THE BARTHEL SOLDERING TORCH.

Investigating Charges of Bribery at New Brunswick, N. J.

A special committee is investigating charges of alleged bribery brought against members of the Board of Aldermen of New Brunswick, N. J., in order to secure the recent passage of a trolley ordinance. City Treasurer James Nelson testified that he was informed by Mr. Ballantine that a Mr. Snader, of the New York and Philadelphia Traction Company, had informed him that his company had given $20,000 in two certified checks. He testified further that it had been understood that the money was to go to ex-Congressman Miles Ross, City Collector W. H. Price and Judge J. K. Rice.

V. E. Vanfleet, in whose office the rumors are said to have originated, testified that during the conversation he had heard Mr. Snader say that they had got $20,000. Mr. Ballantine asked, "Who?" "The fellows at New Brunswick," replied Mr. Snader. The witness said that Mr. Snader stated that he had seen one of the certified checks for $10,000 paid over to a man who was said to be connected with Miles Ross. Mr. Ballantine had asked him if William Price was the name of the man, and he had at once replied that "that was the party."

John E. Snader testified that the money referred to had nothing to do with the electric railway in New Brunswick. Charles J. Carpenter testified that he met E. J. Wessels in New York. Mr. Wessels, the witness said, read a conversation which had taken place between himself and Judge Rice. It had been taken down by a stenographer in an adjoining room. The transcript was to the effect that Judge Rice wanted to be retained as counsel for the road, and intimated further that the boss required $20,000 in bonds or money.

A Large Wire Contract for the American Electrical Works.

Mr. Francis E. Donohoe, who was recently appointed Western agent for the American Electrical Works, of Providence, R. I., is making a record for the Chicago office, 241 Madison street. After a hard fight Mr. Donohoe has succeeded in closing a contract for wire with Mr. Yerkes, of the North and West Chicago city roads, amounting to almost $118,000. This is a large order, and both Mr. Donohoe and the American Electrical Works are to be congratulated on securing it.

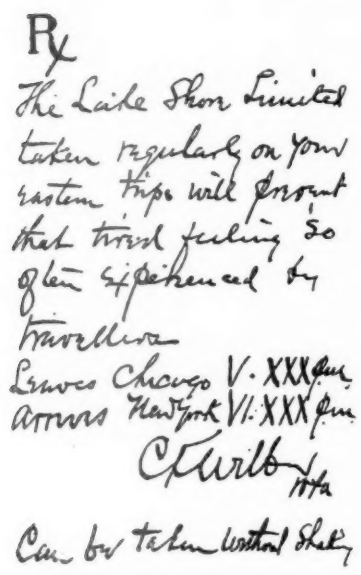
Accident to an Electrical Man.

When the ferryboat "Netherlands" crashed into her pier at the foot of Barclay street, New York city, last Friday, a number of passengers were injured. Among these was Mr. J. C. Saxton, an electrical commission merchant, of 52 Broadway, who was so severely cut by broken glass that he had to be taken to an hospital.

The Schuylkill, Pa., Electric Railway Company proposes to erect a $100,000 power plant with a capacity of 1,500 horse-power.

A Novel Advertisement.

The illustration herewith is reproduced from a novel advertisement just issued by the Lake Shore and Michigan Southern Railway. It was designed by Mr. C. K. Wilber, of Chicago, Ill., who is the Western



A NOVEL ADVERTISEMENT.

passenger agent of the road. The advertisement represents a physician's prescription hastily written on a leaf taken from a pocket prescription book. The effectiveness of the scheme lies in its novelty and we do not doubt but that everyone whose glance is caught by it will read it.

J. H. Bunnell & Co.'s Catalogue of Electric Railway Appliances.

The ELECTRICAL REVIEW has received an early copy of the latest edition of catalogue No. 14, issued by J. H. Bunnell & Co., of New York city. It is quite comprehensive. In addition to electric railway appliances, it covers all telegraph, telephone and electric lighting supplies, as well as of phonographs, graphophones and other devices in which electricity is an essential factor, or connected with in the remotest way. This edition is very complete, presenting in the neatest, most compact and comprehensive manner the facts and figures contained in its 225 pages and nearly 750 illustrations. It will pay you to send for a copy.

ELECTRIC LIGHT FLASHES.

The Northwest Electric Light Company, of Winnipeg, Man., will double their capacity next Summer, spending some $40,000.

The village board of Galesville, Wis., has passed a resolution granting a 15 year franchise to D. M. Benton & Company for electric lighting.

Electrical Engineer Dow thinks that the Detroit, Mich., municipal electric light plant may begin to supply current some time next Summer.

An artesian gusher was recently struck at the new plant of the Minneapolis, Minn., General Electric Company, which has a flow of 48,000 gallons per hour.

The electric light franchise in Springfield, Mo., expired on November 24, and, as the council and companies cannot come to terms on future lighting, the city has decided to light with gasoline.

The New York City Gas Commission has approved of the form of contract for electric lighting adopted for the year 1895. The Commission has ordered 150 new lights for the city and the annexed district.

A company headed by Russell B. Harrison has secured a five years' contract for lighting the city of Terre Haute, Ind., the price calling for $63.95 a light. The old company bid $90. It retaliated against the Harrison company by applying for a street railway franchise.

The plant of the Milwaukee, Wis., Arc Light Company has been sold to four of the directors, who were incorporators of the company. The directors who have assumed control of the business and of the liabilities are F. C. Ehlers, Charles Kirchhoff, Jr., J. J. Kempf and Dr. W. H. Earles, the latter being president of the old company.

The Edison Electric Light Company, of Lancaster, Pa., secured control of the Citizens' Electric Light Company and the Lancaster Gas Company. Since the Citizens' company began business there has been a war between the companies, resulting in consumers getting electric light very cheap. It was announced that rates will be put up at once.

A company has been organized at McMinnville, Ore., to construct an electric light and water system. The water is to be taken from the hills two miles north, the ordinance having been passed by the city for the use of streets for that purpose. The water system is to be completed in 12 months and the light plant within 18. A Portland contractor is thought to be back of the undertaking.

The Edison Electric Light Company has filed an appeal in the United States Circuit Court at New York city from a decision of Judge Lacombe, refusing an injunction to the company, preventing Robert Stafford and Harry P. Whittaker, of the Hotel Imperial, from using incandescent lamps procured from McLeod, Ward & Company and other firms, to which Thomas A. Edison claims the patent rights

The Edison Electric Light Company, of Columbus, Ohio, have just finished a steel smoke stack 151 feet eight inches high, 17 feet in diameter at the base, tapering in eight feet of height to 10 feet six inches in diameter and running from there the same to the top, where it is tapered to 15 feet six inches diameter. The base plate to which the stack is riveted is 20 feet in diameter and weighs 28,000 pounds, is bolted down to the foundation with 24 bolts two and one-quarter inches in diameter and extending down into the foundation 23 feet deep.

The Metropolitan Telephone Company, 18 Cortlandt St., offers New York City Exchange service at $80 per year upward, according to use, Metallic Circuit Line; Full Long Distance Equipment.

WHITE-CROSBY COMPANY,
CONTRACTING ENGINEERS,
EQUITABLE BUILDING, BALTIMORE, MD.
New York Office, 29 Broadway.
Chicago Office, The Rookery.

ALL KINDS PRICES OF PARTS Dynamos and Motors AND PARTS OF SAME TELEPHONES ELECTRICAL SUPPLIES
SEND STAMP FOR CATALOGUE PALMER BROS. MANUS, CONN.

THE LEHIGH VALLEY
CREOSOTING CO.
WORKS, PERTH AMBOY, N. J.
Office, Rooms 136 and 137, 1 Broadway, NEW YORK.
Creosoted Lumber, Underground Conduits.
Telegraph Poles, Piling and Ties Furnished.

POLE PAINT.
The most economical pole paint is the
McINTOSH.
Will outlast anything in the market.
Write for prices.
GEO. L. COLGATE COMPANY, Manufacturers,
136 Liberty Street, New York.

Practically every hour the New York Central has a through passenger train to the North and West.

JUST OUT.
A SPLENDID BOOK FOR
STREET RAILWAY MEN.
256 PAGES. Price $1.00. POSTAGE PREPAID.
Electric Railway Motors:
THEIR
CONSTRUCTION, OPERATION AND MAINTENANCE.
AN ELEMENTARY PRACTICAL HANDBOOK FOR THOSE ENGAGED IN THE MANAGEMENT AND OPERATION OF ELECTRIC RAILWAY APPARATUS.
RULES AND INSTRUCTIONS FOR MOTORMEN.
By NELSON W. PERRY, E. M.
Address, ELECTRICAL REVIEW,
13 PARK ROW,
P. O. Box, 2339. NEW YORK.

THE PINTSCH GAS LIGHTING SYSTEM

Has been adopted as the STANDARD LIGHT by the Broadway and Third Avenue Cable Lines, of New York City; the North and West Chicago Cable Lines, and the Columbus Central Electric Line, of Columbus, O., also by sixty of the most prominent railways and by the Pullman and Wagner Palace Car Companies in the United States.

It has been the standard lighting system in Europe for many years, and is applied to 55,000 cars in Europe, the United States, South America, India and Australia.

For particulars, address

THE SAFETY CAR HEATING AND LIGHTING COMPANY,
160 Broadway, New York.

KINDRED INTERESTS

The Berlin Iron Bridge Company, of East Berlin, Conn., have just completed for the Baldwin Locomotive Works, of Philadelphia, Pa., steel roof trusses for the addition to their wheel shop.

The Clonbrock Steam Boiler Works, 564 Smith street, Brooklyn, N. Y., have just finished the installation of a 350 horse-power "Morrin" Climax steam boiler for the electric light company at Lebanon, Pa.

Twenty-five customers standing two deep before the counters on Monday morning was what a representative of the ELECTRICAL REVIEW saw in the store of J. H. Bunnell & Co., New York. This well-known electrical supply house can certainly have no complaint of the state of business.

The Hornberger Electric Manufacturing Company, Elkhart, Ind., have prepared a new catalogue illustrating and describing the "Elkhart" transformers for alternating currents. These transformers have made a most favorable impression, as the large number of testimonials published in the pamphlet would indicate.

The Metropolitan Electric Company, Nos. 186 and 188 Fifth avenue, Chicago, have made arrangements with the patentee to handle the Allen soldering stick, and have a large stock on hand, and will be able to sell to the dealer or consumer at satisfactory prices. This little article is well known to the trade and occupies its niche in the gallery of specialties of the Metropolitan company.

The question of reorganizing the Schuyler Electric Company, of Middletown, Conn., is again being agitated. Hartford capitalists are said to be interested in the new movement. Middletown's business men are anxious to see business resumed there, but there seems to be a feeling of indifference as to how the money shall be raised. It is understood that unless something definite is done, business men from elsewhere may take steps which may result in the removal of the business from Middletown.

The Berlin Iron Bridge Company, of East Berlin, Conn., will furnish the new power station for the United Electric Light and Power Company, on East Twenty-eighth street, New York city. The power house is 100 feet wide and 200 feet long; the engine room is 100 feet wide and 80 feet long, and the boiler room is 56 feet wide and 100 feet long, the whole covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roofing. The coal pockets in the boiler room have a capacity of 3,000 tons.

The Mather Electric Company, of Manchester, Conn., have just concluded arrangements with Manning, Maxwell & Moore, of New York, and the Niles Tool Works, of Hamilton, Ohio, for a large amount of new machine tools, which will be installed in the Manchester plant at once and which are especially adapted for the building of large direct connected and belted generators, of which the Mather company are now making quite a specialty. The plant at Manchester has been running over-time with full force for the last two months, and the company now has orders on hand to keep their entire plant busy from four to five months.

Owing to the assignment of the Altoona Manufacturing Company, Mr. Edward F. Austin, their former sales agent in the Pittsburgh district, who met with such success in the sale of their engines, has taken charge of the Pittsburgh office of the Phœnix Iron Works Company, of Meadville, Pa., manufacturers of the well-known Dick & Church engines, boilers, feed water heaters, etc. Mr. Austin reports the sale of a 15x18 engine to Jones & Laughlin and three 100 horse-power boilers for the Schenley Park Casino. These boilers are particularly designed for safety, etc., and are of special make all through. He also reports several smaller sales, and states that inquiry is increasing from all localities and that he looks forward to an increase of trade in the boiler and engine business.

Elmer G. Willyoung & Company.—Mr. Elmer G. Willyoung has just returned from a two months' visit to England, where he has consummated arrangements for acting as the sole American agent for Messrs. Nalder Brothers & Company, London, the largest manufacturers of electrical instruments of precision in the world. He will also act as the agent for James White, Glasgow, Scotland, maker of Sir Wm. Thomson's balances and electro-static measuring instruments, and for L. Oertling, London, analytical and assay balances. Mr. Willyoung, who was for six years the electrical expert of Queen & Company, is recognized as among the first to seriously take up in America the manufacture of electrical instruments of precision and is the author of many improvements and refinements in electrical measuring instruments. Arrangements have also been made with other foreign firms to import apparatus at most advantageous rates, and to have any instruments which may be damaged in transit, repaired by experienced workmen under the personal supervision of Mr. Willyoung. It is the intention of Nalder Brothers & Company and James White to make as rapidly as possible such modifications in the design of their instruments as shall better adapt them to the needs of American users, and new instruments, especially fitted for American practice, will be designed and brought out as rapidly as possible. Mr. Clayton W. Pike, formerly of Queen & Company, will be associated with Mr. Willyoung. Mr. Pike was in charge of all the World's Fair exhibits of Queen & Company and has a very extensive acquaintance among the colleges and technical schools, having personally visited nearly all of them during the year previous to the World's Fair, for the purpose of obtaining a better acquaintance with their requirements.

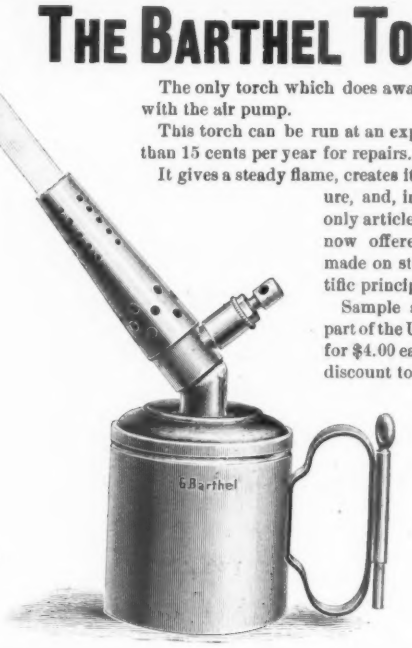
THE BARTHEL TORCH.

The only torch which does away absolutely with the air pump.

This torch can be run at an expense of less than 15 cents per year for repairs.

It gives a steady flame, creates its own pressure, and, in fact, is the only article of this kind now offered which is made on strictly scientific principles.

Sample sent to any part of the United States for $4.00 each. Liberal discount to the trade.



BARTHEL TORCH CO.,
113 DEVONSHIRE ST.,
BOSTON.

KNABE PIANOS

EUGENE D'ALBERT: From the fullest conviction I declare them to be the best Instruments of America.

DR. HANS VON BULOW: I declare them the absolutely best in America.

ALFRED GRÜNFELD: I consider them the best Instruments of our Times.

P. TSOHAIKOWSKY: Combines with great volume of Tone a rare sympathetic and noble Tone Color and perfect action.

WAREROOMS:
No. 148 FIFTH AVENUE, NEW YORK,
NEAR TWENTIETH STREET.

BALTIMORE: 22 and 24 E. Baltimore St.
WASHINGTON: 817 Pennsylvania Ave.

The private compartment car of the New York Central's "Chicago Limited" and "North Shore Limited" trains is the acme of luxurious travel.

Chicago Limited, New York Central, leaves New York, 10.30 this morning; arrives Chicago 9.50 to-morrow morning.

W. R. OSTRANDER & CO.
No. 204 FULTON ST., NEW YORK.
Manufacturers of
SPEAKING TUBES, WHISTLES, ANNUNCIATORS,
Electric and Mechanical Bells.
FACTORY,
De Kalb Ave.,
BROOKLYN.
Send for Illustrated Catalogue.

ROYCE & MAREAN,
DEALERS IN
Electrical Supplies,
WASHINGTON, D. C.

North Shore Limited, New York Central, leaves New York 4.30 this afternoon; arrives Chicago 4.30 to-morrow afternoon.

Chicago Special, New York Central, leaves New York 1 P. M. to-day; arrives Chicago 2.40 P. M. to-morrow.

BEST FOR ALL Electrical Work

PATENT PERFORATED ELECTRIC LEATHER BELTING

CHARLES A. SCHIEREN & CO.,
Patentees and Sole Manufacturers.
47 Ferry Street, New York.
226 No. Third Street, Phila.
46 So. Canal Street, Chicago
119 High Street, Boston.

A Suggestion That Everyone Should Heed.

Put your savings in an investment exempt from fluctuation in value and beyond the reach of commercial disaster.

There are no receiverships, reorganizations or repudiations possible in the promise to pay of the *Mutual Life Insurance Company.*

The income of the Mutual last year was $41,953,145.68; its outstanding insurance $708,692,552.40, and its assets $186,707,680.14.

Every desirable form of policy is issued by the Mutual Life Insurance Company.

For particulars, address
WALTER H. COOKE,
32 Liberty Street,
NEW YORK CITY.

Sight Feed Oil Cups.
AUTOMATIC "WIPING DEVICE"
For oiling Crank and Cross-head Pins.
WM. H. WILKINSON,
352 Atlantic Ave., Boston, Mass.